PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-170837
(43)Date of publication of application : 14.06.2002

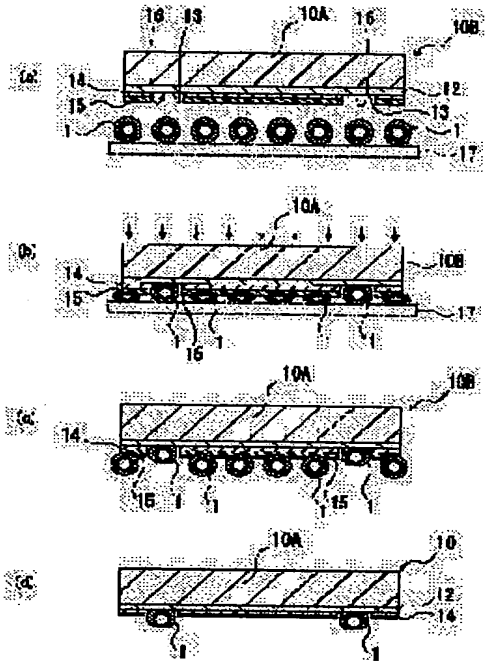
(51)Int.Cl. H01L 21/60

(21)Application number : 2000-364026
(22)Date of filing : 30.11.2000

(71)Applicant : SONY CHEM CORP
(72)Inventor : TAKECHI MOTOHIDE
KURODA SHINICHI
SUGA YASUHIRO

(54) METHOD FOR PACKAGING SEMICONDUCTOR DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a semiconductor-device packaging method capable of exactly connecting each of electrodes of semiconductor devices located at a fine pitch and a circuit substrate each other.
SOLUTION: The method for manufacturing IC chips 10 used for packaging consists of a process of forming a photoresist film 14 on a portion other than a padding portion 13 of a IC chip 10A, a process of heating/pressing the IC chip 10A onto adhesive conductive-particles 1 after dispersing the adhesive conductive-particles 1 on a plane plate 17, and a process of leaving the adhesive conductive-particles 1 only on the padding portion 13 of the IC chip 10A by removing the adhesive conductive-particles 1 applied to the photoresist 14.



LEGAL STATUS

[Date of request for examination] 06.09.2002

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－170837
（P2002－170837A）
(43)公開日　平成14年６月14日(2002.6.14)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｈ０１Ｌ　21/60		Ｈ０１Ｌ　21/60	３１１Ｓ	５Ｆ０４４
	３１１	21/92	６０４Ｆ	

審査請求　未請求　請求項の数７　ＯＬ　（全７頁）

(21)出願番号　特願2000－364026(P2000－364026)

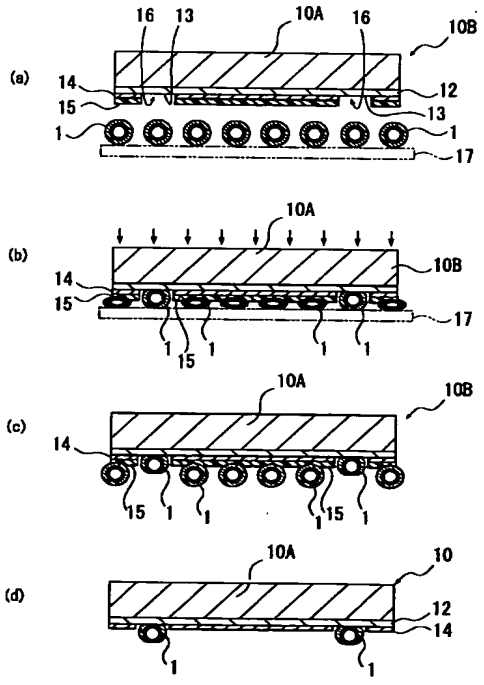
(22)出願日　平成12年11月30日(2000.11.30)

(71)出願人　000108410
ソニーケミカル株式会社
東京都中央区日本橋室町１丁目６番３号
(72)発明者　武市　元秀
栃木県鹿沼市さつき町12－３　ソニーケミカル株式会　第２工場内
(72)発明者　黒田　信一
栃木県鹿沼市さつき町12－３　ソニーケミカル株式会　第２工場内
(74)代理人　100106666
弁理士　阿部　英樹　（外１名）

最終頁に続く

(54)【発明の名称】　半導体素子の実装方法

(57)【要約】
【課題】ファインピッチの半導体素子及び回路基板の各電極同士を確実に接続することができる半導体素子の実装方法を提供すること。
【解決手段】本発明に係る実装用ＩＣチップ１０の製造方法は、ＩＣチップ１０Ａのパッド部１３以外の部分にレジスト膜１４を形成する工程と、接着性導電粒子１を平板１７上に分散して接着性導電粒子１に対してＩＣチップ１０Ａを加熱加圧する工程と、レジスト膜１４に付された接着性導電粒子１を除去することによってＩＣチップ１０Ａのパッド部１３のみに接着性導電粒子１を残す工程とを有することを特徴とする。



1

【特許請求の範囲】

【請求項１】所定の弾性を有する球状の樹脂粒子に金属膜を施した導電粒子に所定の接着剤を付した接着性導電粒子を用い、

半導体素子の電極以外の部分にレジスト膜を形成する工程と、

前記接着性導電粒子を所定の平面上に分散して当該接着性導電粒子に対して前記半導体素子を加熱加圧する工程と、

前記半導体素子の電極以外の接着性導電粒子を除去することによって前記半導体素子の電極のみに前記接着性導電粒子を残す工程とを有することを特徴とする実装用の半導体素子の製造方法。

【請求項２】前記接着性導電粒子を前記レジスト膜とともに除去することを特徴とする請求項１記載の半導体の製造方法。

【請求項３】前記接着性導電粒子は、前記導電粒子の復元率が、２０％変形時で５％以上であることを特徴とする請求項１又は２のいずれか１項記載の実装用の半導体素子の製造方法。

【請求項４】前記接着性導電粒子は、前記接着剤が、所定の温度以上に加熱された場合にのみ接着性を有することを特徴とする請求項１乃至３のいずれか１項記載の実装用の半導体素子の製造方法。

【請求項５】請求項１乃至４記載のいずれか１項記載の製造方法によって得られた実装用の半導体素子を用い、当該半導体素子の接着性導電粒子を基板上の所定の電極に位置決めしてから、当該半導体素子を前記基板に加熱圧着することを特徴とする半導体素子の実装方法。

【請求項６】請求項１乃至４のいずれか１項記載の製造方法に用いられた接着性導電粒子に対し、所定の電極がこれに形成されたレジスト膜から当該接着性導電粒子を所定数だけ収容可能な大きさで開口していることを特徴とする実装用の半導体素子。

【請求項７】所定の電極がこれに形成されたレジスト膜から所定の大きさで開口し、当該開口した部分に請求項１乃至４のいずれか１項記載の製造方法に用いられた接着性導電粒子が前記電極と接着された状態で配置されていることを特徴とする実装用の半導体素子。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、半導体素子を回路基板に実装する方法に関する。

【０００２】

【従来の技術】従来より、回路基板にベアのＩＣチップを実装する手段としては、例えば、絶縁性接着材に導線粒子を分散させた、フィルム状あるいはペースト状の異方導電性接着剤や、銀ペースト、はんだ等が用いられている。

【０００３】

2

【発明が解決しようとする課題】ところで、近年、回路基板の電極数の増加により電極間をファインピッチ化することが行われており、これに伴ってＩＣチップにも電極間のファインピッチ化への対応が図られている。

【０００４】しかしながら、従来技術において、このような回路基板及びＩＣチップの電極同士を接続する際、銀ペーストを用いた場合には、絶縁された部分に銀が析出する現象（マイグレーション）が生じるおそれがあり、また、はんだを用いた場合には、はんだのはみ出した部分に余分な接続部分ができる現象（はんだブリッジ）が生じるおそれがあり、いずれの場合であっても、ショート発生の原因となるため、ファインピッチの接続には適さないという問題があった。

【０００５】一方、異方導電性接着剤を用いた場合には、回路基板の電極自体の狭小化に伴ってＩＣチップのバンプ電極も狭小化され、このようなバンプ電極と回路基板の電極の間に導電粒子を介在させることが困難であるため、接続信頼性の点で問題があった。

【０００６】本発明は、このような従来の技術の課題を解決するためになされたもので、その目的とするところは、ファインピッチの半導体素子及び回路基板の各電極同士を確実に接続することができる半導体素子の実装技術を提供することにある。

【０００７】

【課題を解決するための手段】上記目的を達成するためになされた請求項１記載の発明は、所定の弾性を有する球状の樹脂粒子に金属膜を施した導電粒子に所定の接着剤を付した接着性導電粒子を用い、半導体素子の電極以外の部分にレジスト膜を形成する工程と、接着性導電粒子を所定の平面上に分散してその接着性導電粒子に対して半導体素子を加熱加圧する工程と、前記半導体素子の電極以外の接着性導電粒子を除去することによって半導体素子の電極のみに接着性導電粒子を残す工程とを有することを特徴とする実装用の半導体素子の製造方法である。

【０００８】請求項２記載の発明は、請求項１記載の発明において、接着性導電粒子をレジスト膜とともに除去することを特徴とする。

【０００９】請求項３記載の発明は、請求項１又は２のいずれか１項記載の発明において、接着性導電粒子は、導電粒子の復元率が、２０％変形時で５％以上であることを特徴とする。

【００１０】請求項４記載の発明は、請求項１～３のいずれか１項記載の発明において、接着性導電粒子は、接着剤が、所定の温度以上に加熱された場合にのみ接着性を有することを特徴とする。

【００１１】請求項５記載の発明は、請求項１～４のいずれか１項記載の製造方法によって得られた実装用の半導体素子を用い、当該半導体素子の接着性導電粒子を基板上の所定の電極に位置決めしてから、当該半導体素子

を前記基板に加熱圧着することを特徴とする半導体素子の実装方法である。

【００１２】請求項６記載の発明は、請求項１～４のいずれか１項記載の製造方法に用いられた接着性導電粒子に対し、所定の電極がこれに形成されたレジスト膜から当該接着性導電粒子を所定数だけ収容可能な大きさで開口していることを特徴とする実装用の半導体素子である。

【００１３】請求項７記載の発明は、所定の電極がこれに形成されたレジスト膜から所定の大きさで開口し、当該開口した部分に請求項１～４のいずれか１項記載の製造方法に用いられた接着性導電粒子が電極と接着された状態で配置されていることを特徴とする実装用の半導体素子である。

【００１４】請求項１記載の発明によれば、半導体素子の電極のみに接着性導電粒子を積極的に配置した実装用の半導体素子を用いるようにしたことから、回路基板のファインピッチ化された電極に対しても、例えば、請求項６又は７記載の発明のように、ファインピッチ化に対応しうる、実装用の半導体素子を得ることができ、そして、請求項５記載の発明のように、かかる半導体素子を用いることにより、確実に接続信頼性を得ることができる。

【００１５】特に、請求項６記載の発明の場合、実装用の半導体素子の開口した部分に、接着性導電粒子を凝集させずに単独で配置できるという利点がある。

【００１６】また、請求項２記載の発明によれば、例えばアルカリ性エッチャントを用いることによって電極以外の接着性導電粒子をレジスト膜とともに容易に除去することができる。

【００１７】さらに、請求項３記載の発明によれば、製造方法に用いる接着性導電粒子の中核をなす導電粒子の反発力を、所定の復元率で規制することにより、半導体素子に接着性導電粒子を熱圧着した際に導電粒子が所望の値以上復元するため、接着性導電粒子が半導体素子の表面から確実にはみ出た実装用の半導体素子を得ることができるとともに、加圧後において導電粒子の樹脂部分が塑性変形を起こさず、エージング後に電極同士の間隔が変化しても導電粒子がこれに伴って弾性変形するため、導通抵抗が上昇する事態を防ぐことができる。

【００１８】さらにまた、請求項４記載の発明によれば、常温では接着性をもたない接着剤を用いることにより、実装用の半導体素子を作製する際に取扱いやすい接着性導電粒子を得ることができる。

【００１９】

【発明の実施の形態】以下、本発明に係る実装用の半導体素子の製造方法及びこれを用いた実装方法の好ましい実施の形態を詳細に説明する。図１は、本実施の形態の接着性導電粒子の製造方法を示す図である。

【００２０】図１を参照して、本実施の形態の接着性導電粒子１の製造方法について説明する。接着性導電粒子１を製造するには、まず、直径１．０～２０．０（中央値１０）μｍの球状樹脂２に、例えばニッケル－金等からなる金属めっき３を施した導電粒子４を用いる。この導電粒子４は、球状樹脂２の表面に金属めっき３が形成されてなる。

【００２１】導電粒子４の球状樹脂２には、その材料として、所定の外力に対して一定の範囲の弾性領域を示す性質、すなわち、所定の反発力を有するものであれば、特に樹脂の種類を問わず、例えば、スチレン系樹脂、アクリル系樹脂、ポリエステル系樹脂等が用いられる。

【００２２】ここで、本実施の形態の場合は、導電粒子４の反発力を定量化するため、２０％圧縮変位時の復元率Ｒを用いる。この復元率Ｒは、導電粒子４に圧縮して加える荷重を反転荷重値（例えば１Ｎ）まで増加させ、その荷重を境に導電粒子に加える荷重を原点荷重値（例えば０．２Ｎ）まで減少させ、次式に示すように、反転荷重値をとるまでの圧縮に伴う変位Ｌ１と、原点荷重値をとるまでの復元に伴う変位Ｌ２の比を百分率で表した値で定義する。

【００２３】復元率Ｒ＝（Ｌ２／Ｌ１）×１００（％）

このような導電粒子４の表面に、所定の接着剤を霧状にして塗布しその後例えば６０℃で乾燥する、いわゆるスプレードライヤ法により接着剤５の膜を均一に形成することによって接着性導電粒子１を得る。

【００２４】この場合、接着性導電粒子１の製造に用いる接着剤５は、接着性及び接着性導電粒子１の取扱い性の観点からでは、特に、接着剤５の材料としての種類を問わず、常温で接着性が無く、例えば８０℃以上に加熱された場合に軟化又は溶融することによって接着性を有する性質があればよい。例えば、接着材５には、エポキシ樹脂、ポリエステル系樹脂、ウレタン系樹脂等の熱硬化性樹脂や、アクリル系樹脂等の熱可塑性樹脂が用いられる。

【００２５】ただし、接着の安定性を確保する観点からでは、接着性導電粒子１の接着剤５に、例えば、ジシアンジアミド、ヒドラジッド、イミダゾール、フェノール、ブロックイソシアネート等のような硬化剤を添加することが好ましい。

【００２６】また、本実施の形態に用いる接着剤５は、後述するレジスト膜を除去する際に用いるエッチャントに浸食されないという物性を要する。

【００２７】図２（ａ）～（ｃ）は、本実施の形態の実装用ＩＣチップの製造方法の中間工程を示す図である。図３は、同実装用ＩＣチップの製造方法に用いられるＩＣチップの電極側を示す図である。

【００２８】図２を参照して、本実施の形態の実装用ＩＣチップ１０の製造方法の中間工程について説明する。図２（ａ）に示すように、実装用ＩＣチップ（実装用の半導体素子）１０を作製するには、まず、ＩＣチップ１

０Ａを用いる。このＩＣチップ１０Ａは、半導体チップ１１の一面に形成されたアルミニウムパターン１２上に複数のパッド部（電極）１３が所定の形状に形成されて構成される。図３に示すように、本実施の形態の場合、これらのパッド部１３は、例えば、所定の大きさの四角形状で、半導体チップ１１の縁部分に一定の間隔をおいて配列されている。

【００２９】ここで、本実施の形態の場合、接着性導電粒子１の外径は、パッド部１３に所定の数を配置させる観点から、パッド部１３の一辺の長さ（例えば２０μｍ）に対して３～２０μｍであることが好ましい。

【００３０】また、ＩＣチップ１０Ａのパッド部１３以外のアルミニウム１２上には、窒化ケイ素（ＳｉＮ）により保護酸化膜１４が形成され、これにより、パッド部１３のみが露出するようになっている。

【００３１】次に、図２（ｂ）に示すように、このようなＩＣチップ１０Ａのパッド部１３及び保護酸化膜１４側の一面に、アクリル系レジストを塗布してレジスト膜１５を形成する。ここで、レジスト膜１５の厚さは、特に限定されることはないが、現像精度の観点から、１～１０μｍとすることが好ましい。

【００３２】そして、図２（ｃ）に示すように、パッド部１３上のレジスト膜１５のみを公知のフォトリソグラフィ技術により除去する。これにより、図２（ｃ）に示すように、ＩＣチップ１０Ａの各パッド部１３の外周部分には、保護酸化膜１２及びレジスト膜１４の層からなる壁部、すなわち、各パッド部１３ごとに保護酸化膜１２及びレジスト膜１４の厚さ相当の深さ（１～１５μｍ）をもってパッド部１３を底とするコンタクトホール１６が形成される。そして、このようなコンタクトホール１６に接着性導電粒子１を収容可能な中間段階での実装用ＩＣチップ１０Ｂを得る。

【００３３】図４は、図２の中間工程で得られた実装用ＩＣチップの製造方法の最終工程を示す図である。図４を参照して、本実施の形態の実装用ＩＣチップ１０の製造方法の最終工程について説明する。

【００３４】図４（ａ）に示すように、まず、常温において、所定の平板１７上に接着性導電粒子１を均一に分散し、接着性導電粒子１が、平板１７上で単位面積当たりにつき粒子が占める面積の割合を２５％以上の範囲に含まれるようにする。この場合、接着性導電粒子１の表面は、常温で接着性がないため、接着性導電粒子１同士が凝集することはない。

【００３５】一方、平板１７の表面には、接着性導電粒子１が剥がれやすいように、例えばシリコン等のような剥離処理が施されていることが好ましい。

【００３６】そして、このような接着性導電粒子１に対して、中間段階の実装用ＩＣチップ１０Ｂを配置する。

【００３７】次に、図４（ｂ）に示すように、実装用ＩＣチップ１０Ｂを、例えば、温度８０℃で加熱しながら、荷重２Ｎで加圧する。

【００３８】この場合、平板１７上の接着性導電粒子１の大部分は、実装用ＩＣチップ１０Ｂのレジスト膜１５に押されることによってつぶれる一方で、導電粒子４の表面上の接着剤５が加熱されて溶融することによって接着性導電粒子１がレジスト膜１５に接着する。

【００３９】一方、接着性導電粒子１の一部は、実装用ＩＣチップ１０Ｂの各コンタクトホール１６にはまり、その底にあるパッド部１３に押されることによってつぶれる一方で、その表面上の接着剤５が加熱されて溶融することによって接着性導電粒子１がパッド部１３に接着する。

【００４０】ここで、本実施の形態の場合、実装用ＩＣチップ１０Ｂのパッド部１３の大きさに対して接着性導電粒子１の外径比を一定の範囲内で定め、さらに、コンタクトホール１６の深さを接着性導電粒子１の外径より小さくしたことから、実装用ＩＣチップ１０Ｂの各コンタクトホール１６には、計算上、少なくとも１個の接着性導電粒子が、互いに接触しない状態で収容されることになる。

【００４１】図４（ｃ）に示すように、加圧荷重を除去して平板１７を実装用ＩＣチップ１０Ｂから剥離した後に苛性ソーダ水に浸漬し、レジスト膜１５をこれに付着した接着性導電粒子１とともに、実装用ＩＣチップ１０Ｂから除去する。一方、接着性導電粒子１の接着剤５は、苛性ソーダ水に浸食されないため、接着性導電粒子１は、パッド部１３に接着されたままである。

【００４２】これにより、図４（ｄ）に示すように、ＩＣチップ１０Ａのパッド部１３のみに接着性導電粒子１を配置した最終段階の実装用ＩＣチップ１０を得る。この実装用ＩＣチップ１０の各パッド部１３には、接着性導電粒子１が、保護酸化膜１３の表面上から部分的に突出した状態で配置される。ここでの接着性導電粒子１は、表面の接着剤５が加熱の際に流動することによって如何なる形状をとっているかにかかわらず、中核となる導電粒子４が加圧の際につぶれた状態から導電粒子４に関して復元率Ｒで定めた反発力により一定量だけ復元している。

【００４３】図５は、図４の最終工程で得られた実装用ＩＣチップを用いた実装方法の工程を示す図である。図５を参照して、本実施の形態の実装用ＩＣチップ１０を用いた実装方法について説明する。

【００４４】図５（ａ）に示すように、まず、最終段階の実装用ＩＣチップ１０と接続すべき回路基板２１を熱圧着用のベース（図示しない）上に固定し、実装用ＩＣチップ１０を回路基板２１に対向配置する。次に、回路基板２１に形成された、所定の回路パターンを有する電極のうち、接続すべき電極２２に対して、実装用ＩＣチップ１０の接着性導電粒子１を位置決めする。

【００４５】そして、図５（ｂ）に示すように、実装用

ＩＣチップ１０を、例えば、温度１８０℃で加熱しながら、荷重１０Ｎで加圧する。この場合、各接着性導電粒子１が、加熱及び加圧されることにより、導電粒子４が、実装用ＩＣチップ１０のパッド部１３と回路基板２１の電極２２との間で、その間にある接着剤５を追い出しながらつぶれる。

【００４６】ここで、導電粒子４は、この形状を球状にしたことから弾性的な等方性を有するため、実装用ＩＣチップ１０のパッド部１３や回路基板２１の電極２２と接触した位置によらず、常に加圧方向にほぼ一定量だけ圧縮される。その結果、実装用ＩＣチップ１０のパッド部１３は、それぞれ、弾性変形した導電粒子４を介して回路基板２１の電極２２とほぼ同一の間隔をもって電気的に接続される。

【００４７】その一方で、各導電粒子４における接着剤５が、導電粒子４と実装用ＩＣチップ１０のパッド部１３及び回路基板２１の電極２２との間に生じた隙間や導電粒子４の表面部分に流れ込み、これにより、導電粒子４を支持体として実装用ＩＣチップ１０のパット部１３と回路基板２１の電極２２との間に挟んだ状態のまま、これら三者とも接着する。その後、このような接着剤５が冷却して硬化すると、実装用ＩＣチップ１０が回路基板２１と電気的に接続された状態を保ったままこれに固定される。

【００４８】以上述べたように本実施の形態によれば、導電粒子４に接着性をもたせたうえで、ＩＣチップ１０Ａのパッド部１３のみに接着性導電粒子１を積極的に配置した実装用ＩＣチップ１０を用いるようにしたことから、回路基板２１のファインピッチ化された電極２２に対しても、確実に接続信頼性を得ることができる。

【００４９】また、本実施の形態によれば、接着性導電粒子１の中核をなす導電粒子４の反発力を、復元率Ｒで規制したことから、ＩＣチップ１０Ａに接着性導電粒子１を熱圧着した際に導電粒子４が所望の値以上復元するため、接着性導電粒子１がＩＣチップ１０の保護酸化膜１３の表面から確実にはみ出た実装用ＩＣチップ１０を得ることができる。

【００５０】特に、本実施の形態の場合、実装用ＩＣチップ１０のコンタクトホール１６の大きさに対して、接着性導電粒子１の外径を一定の割合で定めたことから、各パッド部１３に、接着性導電粒子１を凝集させずに単独で配置することができる。

【００５１】その結果、かかる実装用ＩＣチップ１０を用いることにより、従来技術のように、ＩＣチップ１０Ａのパッド部１３に突状のバンプ電極を設けずに済む一方で、ＩＣチップ１０Ａの電極部分と回路基板２１の電極２２との間に、異方導電性接着剤５中を流動する導電粒子を介在させるという不確実性を解消することができるため、異方導電性接着剤５を用いた場合よりも接続信頼性を向上させることができる。

【００５２】その一方で、接着性導電粒子１の反発力を、復元率Ｒで規制したことから、加圧後において導電粒子４の樹脂部分が塑性変形を起こさず、エージング後に電極同士の間隔が変化しても導電粒４子がこれに伴って弾性変形するため、導通抵抗が上昇する事態を防ぐことができる。

【００５３】さらに、本実施の形態によれば、接着性導電粒子１の導電粒子４を球状にしたことから、ＩＣチップ１０Ａと回路基板２１の各電極同士の間隔をほぼ一定にすることができるため、この点からも接続信頼性を向上させることができる。

【００５４】また、本実施の形態によれば、導電粒子４に常温では接着性をもたない接着剤５を付したことから、実装用ＩＣチップ１０を作製する際に取扱いやすい接着性導電粒子１を得ることができる。

【００５５】特に、本実施の形態の場合、導電粒子４にのみ接着剤５を付したことから、異方導電性接着剤５を用いた場合と比べて接着剤５の量を減らすことができるという利点がある。

【００５６】なお、本発明は、上記実施の形態に限られず、種々の変更を行うことができる。例えば、上記実施の形態においては、接着性導電粒子１に含まれる接着剤５だけで実装用ＩＣチップ１０と回路基板２１を接着するようにしたが、かかる接着力をさらに強化するため、実装用ＩＣチップ１０を回路基板２１に圧着する際にこれらの間に、導電粒子を含まない、フィルム状又はペースト状の接着剤５を介在させることも可能である。

【００５７】また、上記実施の形態においては、接着性導電粒子１を分散する平面として平板１７を用いたが、本発明は、実装用ＩＣチップ１０Ｂの電極側の面自体に直接接着性導電粒子を均一に分散することもできる。

【００５８】

【実施例】以下、本発明に係る実装用ＩＣチップを用いて回路基板への実装した実施例を比較例とともに詳細に説明する。

【００５９】実施例として、復元率５％の導電粒子を核とした接着性導電粒子を、ＩＣチップの各パッド部に接着して実装用ＩＣチップを作製した。

【００６０】比較例として、復元率０％の導電粒子を核とした接着性導電粒子を、ＩＣチップの各パッド部に接着して実装用ＩＣチップを作製した。

【００６１】実施例の実装用ＩＣチップ、比較例の実装用ＩＣチップのそれぞれを、温度１８０℃、荷重２０Ｎ、２０秒間の条件で、回路基板に圧着して接続した。その後、－５５℃と１２５℃の間でのヒートサイクルを１００回繰り返した後に、導通抵抗試験を行った。その結果、端子電極１０個のうち導通不良の端子電極の数を以下に示す。

【００６２】［実施例］

（１）初期　０／１０

（２）ヒートサイクル後　　０／１０

［比較例］

（１）初期　　０／１０

（２）ヒートサイクル後　　５／１０

以上の結果から、実施例の実装用ＩＣチップは、エージング後においても接続信頼性を得られることが明らかになった。

【００６３】

【発明の効果】以上述べたように本発明によれば、ファインピッチの半導体素子及び回路基板の各電極同士を確実に接続することができる半導体素子の実装方法を得ることができる。また、本発明によれば、半導体素子の実装に用いる実装用の半導体素子を得ることができる。

【図面の簡単な説明】

【図１】本実施の形態の接着性導電粒子の製造方法を示す図である。

【図２】（ａ）～（ｃ）本実施の形態の実装用ＩＣチップの製造方法の中間工程を示す図である。

【図３】同実装用ＩＣチップの製造方法に用いられるＩＣチップの電極側を示す図である。

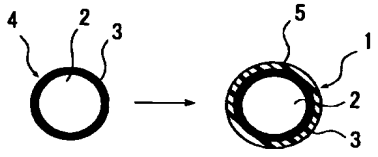
【図４】（ａ）～（ｄ）図２の中間工程で得られた実装用ＩＣチップの製造方法の最終工程を示す図である。

【図５】（ａ）（ｂ）図４の最終工程で得られた実装用ＩＣチップを用いた実装方法の工程を示す図である。

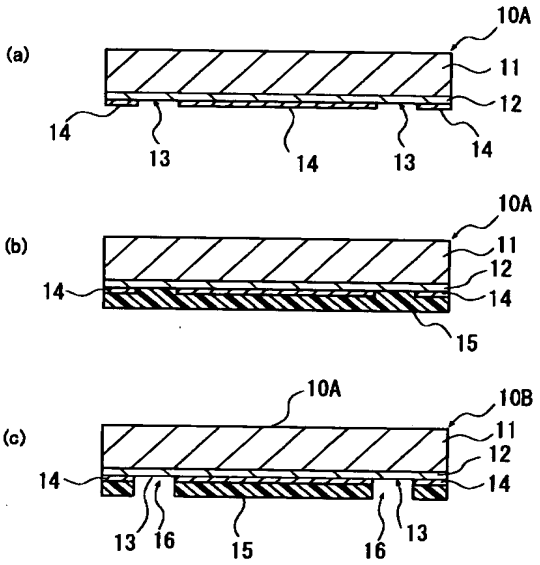
【符号の説明】

１…接着性導電粒子　２…樹脂粒子　４…金属膜　１０…実装用ＩＣチップ（実装用の半導体素子）　１５…レジスト膜

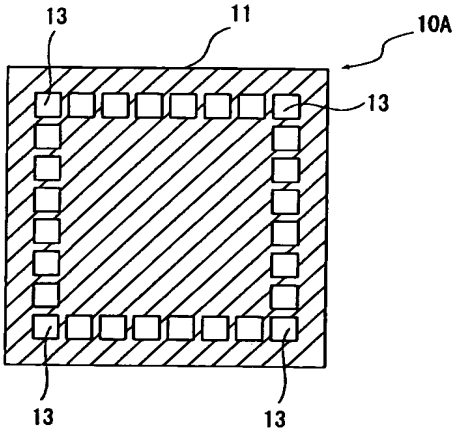
【図１】



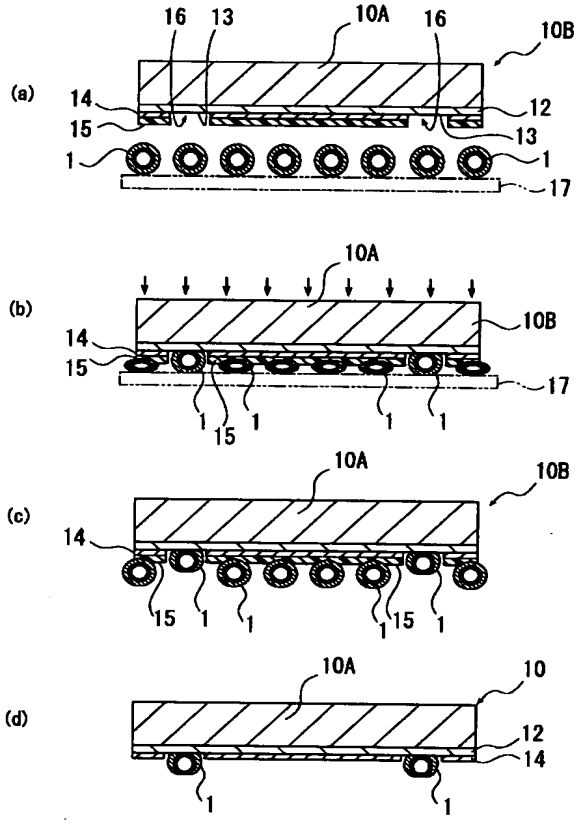
【図２】



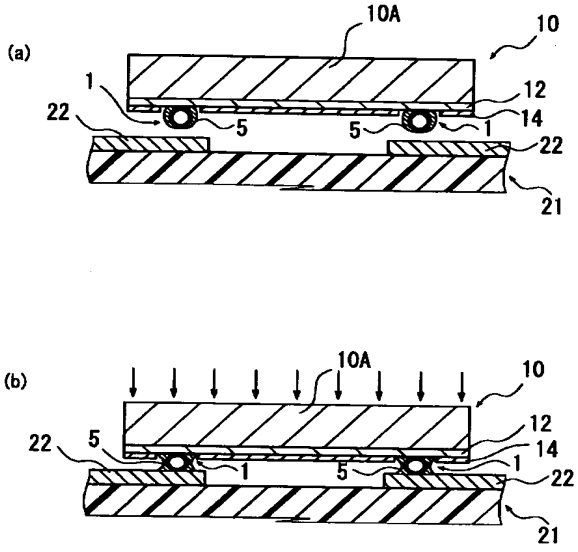
【図３】



【図４】



【図５】



フロントページの続き

(72)発明者　須賀　保博
栃木県鹿沼市さつき町12－３　ソニーケミカル株式会　第２工場内

Ｆターム(参考)　5F044 KK01 LL07 QQ03 QQ04

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] A manufacture method of a semiconductor device for mounting characterized by providing the following. A production process which forms a resist film in portions other than an electrode of a semiconductor device using an adhesive electric conduction particle which gave predetermined adhesives to an electric conduction particle which gave a metal membrane to a spherical resin particle which has predetermined elasticity A production process which distributes said adhesive electric conduction particle on a predetermined plane, and carries out heating pressurization of said semiconductor device to the adhesive electric conduction particle concerned A production process which leaves said adhesive electric conduction particle only to an electrode of said semiconductor device by removing adhesive electric conduction particles other than an electrode of said semiconductor device
[Claim 2] A manufacture method of a semiconductor according to claim 1 characterized by removing said adhesive electric conduction particle with said resist film.
[Claim 3] Said adhesive electric conduction particle is the manufacture method of a semiconductor device for mounting of two claim 1 to which it is the recovery of said electric conduction particle at the 20% deformation time, and it is characterized by being 5% or more, or given in any 1 term.
[Claim 4] Said adhesive electric conduction particle is the manufacture method of a semiconductor device for mounting of three claim 1 characterized by having an adhesive property only when said adhesives are heated beyond a predetermined temperature thru/or given in any 1 term.
[Claim 5] A mounting method of a semiconductor device characterized by carrying out heating sticking by pressure of the semiconductor device concerned at said substrate after positioning an adhesive electric conduction particle of the semiconductor device concerned to a predetermined electrode on a substrate using a semiconductor device for mounting obtained by the manufacture method given [according to claim 1 to 4] in any 1 term.
[Claim 6] A semiconductor device for mounting characterized by carrying out the opening of the adhesive electric conduction particle concerned in magnitude which can hold only a predetermined number from a resist film with which a predetermined electrode was formed in this to an adhesive electric conduction particle used for a manufacture method of four claim 1 thru/or given in any 1 term.
[Claim 7] A semiconductor device for mounting which carries out a opening in predetermined magnitude from a resist film with which a predetermined electrode was formed in this, and is characterized by arranging an adhesive electric conduction particle used for the portion concerned which carried out the opening at a manufacture method of four claim 1 thru/or given in any 1 term in the condition of having pasted up with said electrode.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the method of mounting a semiconductor device in the circuit board.
[0002]
[Description of the Prior Art] Conventionally, as a means to mount IC chip of raise in basic wages in the circuit board, the different direction electroconductive glue of the shape of the shape of a film which made the insulating binder distribute a lead-wire particle, and a paste, a silver paste, solder, etc. are used, for example.
[0003]
[Problem(s) to be Solved by the Invention] By the way, forming inter-electrode into a fine pitch by the increment in the number of electrodes of the circuit board in recent years is performed, and correspondence to the inter-electrode formation of a fine pitch is achieved by IC chip in connection with this.
[0004] however, when connecting such the circuit board and the electrodes of IC chip and a silver paste is used in the conventional technology When a possibility that the phenomenon (migration) in which silver deposits may arise is in the insulated portion and solder is used A possibility that the phenomenon (solder bridge) the amount of excessive connection can do might arise was in the portion which solder protruded, and since it became the cause of short generating even if it is the case where they are any, there was a problem of not being suitable in connection of a fine pitch.
[0005] On the other hand, when different direction electroconductive glue was used, the bump electrode of IC chip was also narrow-ized with narrow-izing of the electrode of the circuit board itself, and since it was difficult to make an electric conduction particle intervene between such a bump electrode and the electrode of the circuit board, there was a problem in respect of connection reliability.
[0006] The place which it was made in order that this invention might solve the technical problem of such a Prior art, and is made into the purpose is to offer the mounting technology of the semiconductor device which can connect certainly each electrodes of the semiconductor device of a fine pitch, and the circuit board.
[0007]
[Means for Solving the Problem] Invention according to claim 1 made in order to attain the above-mentioned purpose A production process which forms a resist film in portions other than an electrode of a semiconductor device using an adhesive electric conduction particle which gave predetermined adhesives to an electric conduction particle which gave a metal membrane to a spherical resin particle which has predetermined elasticity, A production process which distributes an adhesive electric conduction particle on a predetermined plane, and carries out heating pressurization of the semiconductor device to the adhesive electric conduction particle, It is the manufacture method of a semiconductor device for mounting characterized by having a production process which leaves an adhesive electric conduction particle only to an electrode of a semiconductor device by removing

adhesive electric conduction particles other than an electrode of said semiconductor device.
[0008] Invention according to claim 2 is characterized by removing an adhesive electric conduction particle with a resist film in invention according to claim 1.
[0009] In invention of two claim 1 or given in any 1 term, it is the recovery of an electric conduction particle at the 20% deformation time, and an adhesive electric conduction particle is characterized by being 5% or more by invention according to claim 3.
[0010] In invention of claim 1-3 given in any 1 term, as for invention according to claim 4, an adhesive electric conduction particle is characterized by having an adhesive property, only when adhesives are heated beyond a predetermined temperature.
[0011] Invention according to claim 5 is the mounting method of a semiconductor device characterized by carrying out heating sticking by pressure of the semiconductor device concerned at said substrate, after positioning an adhesive electric conduction particle of the semiconductor device concerned to a predetermined electrode on a substrate using a semiconductor device for mounting obtained by the manufacture method of claim 1-4 given in any 1 term.
[0012] Invention according to claim 6 is a semiconductor device for mounting characterized by carrying out the opening of the adhesive electric conduction particle concerned in magnitude which can hold only a predetermined number from a resist film with which a predetermined electrode was formed in this to an adhesive electric conduction particle used for a manufacture method of claim 1-4 given in any 1 term.

[0013] Invention according to claim 7 is a semiconductor device for mounting which carries out a opening in predetermined magnitude from a resist film with which a predetermined electrode was formed in this, and is characterized by arranging an adhesive electric conduction particle used for a manufacture method of claim 1-4 given in any 1 term into the portion concerned which carried out the opening in the condition of having pasted up with an electrode.
[0014] Also as opposed to an electrode with which the circuit board was formed into the fine pitch since a semiconductor device for mounting which has arranged an adhesive electric conduction particle positively was used only for an electrode of a semiconductor device according to invention according to claim 1 For example, a semiconductor device for mounting which can respond to fine pitch-ization can be obtained like invention according to claim 6 or 7, and connection reliability can be certainly acquired by using this semiconductor device like invention according to claim 5.
[0015] Especially, in invention according to claim 6, there is an advantage that it can arrange independently, without making a portion in which a semiconductor device for mounting carried out the opening condense an adhesive electric conduction particle.
[0016] Moreover, according to invention according to claim 2, adhesive electric conduction particles other than an electrode are easily removable with a resist film by using alkaline etchant, for example.
[0017] According to invention according to claim 3, repulsive force of an electric conduction particle which makes a nucleus of an adhesive electric conduction particle used for a manufacture method furthermore, by regulating with predetermined recovery Since an electric conduction particle reverts beyond a desired value when thermocompression bonding of the adhesive electric conduction particle is carried out to a semiconductor device, while being able to obtain a semiconductor device for mounting which an adhesive electric conduction particle overflowed certainly from the surface of a semiconductor device A resin portion of an electric conduction particle does not cause plastic deformation after pressurization, but since an electric conduction particle carries out elastic deformation in connection with this even if a gap of electrodes changes after aging, the situation where flow resistance goes up can be prevented.
[0018] According to invention according to claim 4, in ordinary temperature, an adhesive electric conduction particle which is easy to deal with it in case a semiconductor device for mounting is produced can be obtained by using adhesives without an adhesive property further again.
[0019]
[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of the manufacture method of the semiconductor device for mounting concerning this invention and the mounting method using this

is explained to details. Drawing 1 is drawing showing the manufacture method of the adhesive electric conduction particle of the gestalt this operation.
[0020] With reference to drawing 1 , the manufacture method of the adhesive electric conduction particle 1 of the gestalt this operation is explained. In order to manufacture the adhesive electric conduction particle 1, the electric conduction particle 4 which performed metal plating 3 which consists of nickel-gold etc. is first used for the spherical resin 2 of a diameter 1.0 - 20.0(median 10) mum. As for this electric conduction particle 4, it comes to form the metal plating 3 in the surface of spherical resin 2.

[0021] If it has the property which shows the elastic field of a fixed range to predetermined external force as the material, i.e., predetermined repulsive force, the spherical resin 2 of the electric conduction particle 4 will not be asked especially about the class of resin, for example, styrene resin, acrylic resin, polyester system resin, etc. will be used for it.
[0022] In the case of the gestalt of this operation here, in order to quantify the repulsive force of the electric conduction particle 4, the recovery R at the time of 20% compression displacement is used. As this recovery R makes the load compressed and added to the electric conduction particle 4 increase to a reversal load value (for example, 1N), decreases the load added to an electric conduction particle bordering on that load to a zero load value (for example, 0.2Ns) and is shown in a degree type The value expressed with percentage defines the ratio of the displacement L1 accompanying compression until it takes a reversal load value, and the displacement L2 accompanying a reload until it takes a zero load value.
[0023] Recovery R=(L2/L1) x100 (%)
The adhesive electric conduction particle 1 is obtained by forming the film of adhesives 5 in the surface of such an electric conduction particle 4 at homogeneity with the so-called spray dryer which applies by making predetermined adhesives into the shape of a fog, and is dried after that, for example, 60 degrees C.
[0024] In this case, from a viewpoint of an adhesive property and the handling nature of the adhesive electric conduction particle 1, especially the adhesives 5 used for manufacture of the adhesive electric conduction particle 1 should just have the property to have an adhesive property, by softening or fusing, when the class as a material of adhesives 5 is not asked, there is no adhesive property in ordinary temperature, for example, it is heated by 80 degrees C or more. For example, thermosetting resin, such as an epoxy resin, polyester system resin, and urethane system resin, and thermoplastics, such as acrylic resin, are used for a binder 5.
[0025] However, it is desirable to add curing agents, such as a dicyandiamide, Hydrazide, an imidazole, a phenol, and block isocyanate, in the adhesives 5 of the adhesive electric conduction particle 1 from a viewpoint which secures the stability of adhesion.
[0026] Moreover, the adhesives 5 used for the gestalt of this operation require the physical properties of not corroding to the etchant used in case the resist film mentioned later is removed.
[0027] Drawing 2 (a) - (c) is drawing showing the middle production process of the manufacture method of IC chip for mounting of the gestalt of this operation. Drawing 3 is drawing showing the electrode side of IC chip used for the manufacture method of IC chip for the said mounting.
[0028] With reference to drawing 2 , the middle production process of the manufacture method of the IC chip 10 for mounting of the gestalt of this operation is explained. As shown in drawing 2 (a), in order to produce the IC chip 10 for mounting (semiconductor device for mounting), IC chip 10A is used first. On the aluminum pattern 12 formed in the whole surface of a semiconductor chip 11, two or more pad sections (electrode) 13 are formed in a predetermined configuration, and this IC chip 10A is constituted. In the case of the gestalt of this operation, as shown in drawing 3 , these pad sections 13 have the shape of a quadrangle of predetermined magnitude, set a fixed gap to a part for the edge of a semiconductor chip 11, and are arranged.
[0029] Here, as for the outer diameter of the adhesive electric conduction particle 1, in the case of the gestalt of this operation, it is desirable that it is 3-20 micrometers to a length of one side of a viewpoint to the pad section 13 which arranges a predetermined number in the pad section 13 (for example, 20

micrometers).
[0030] Moreover, on aluminum 12 other than pad section 13 of IC chip 10A, the protection oxide film 14 is formed of silicon nitride (SiN), and, thereby, only the pad section 13 is exposed.
[0031] Next, as shown in drawing 2 (b), an acrylic resist is applied to the pad section 13 of such IC chip 10A, and the whole surface by the side of the protection oxide film 14, and the resist film 15 is formed. Here, although especially the thickness of the resist film 15 is not limited, it is desirable to be referred to as 1-10 micrometers from a viewpoint of development precision.
[0032] And as shown in drawing 2 (c), well-known photolithography technology removes only the resist film 15 on the pad section 13. Thereby, as shown in drawing 2 (c), the wall 16 which consists of a layer of the protection oxide film 12 and the resist film 14, i.e., the contact hole which uses the pad section 13 as a bottom with the depth (1-15 micrometers) of thickness of the protection oxide film 12 and the resist film 14 every pad section 13, is formed in the periphery portion of each pad section 13 of IC chip 10A. And IC chip 10B for mounting in the midcourse phase which can hold the adhesive electric conduction particle 1 in such a contact hole 16 is obtained.
[0033] Drawing 4 is drawing showing the final process of the manufacture method of IC chip for mounting obtained at the middle production process of drawing 2 . With reference to drawing 4 , the final process of the manufacture method of the IC chip 10 for mounting of the gestalt of this operation is explained.
[0034] It is made for the rate of the area for which distributes the adhesive electric conduction particle 1 to homogeneity on the predetermined plate 17, and the adhesive electric conduction particle 1 takes lessons from per unit area on a plate 17 in ordinary temperature first and which a particle occupies to be included in 25% or more of range, as shown in drawing 4 (a). In this case, in ordinary temperature, since the surface of the adhesive electric conduction particle 1 does not have an adhesive property, adhesive electric conduction particle 1 comrades do not condense it.
[0035] It is desirable that exfoliation processing of silicon etc. is performed on the other hand so that the adhesive electric conduction particle 1 may tend to separate in the surface of a plate 17.
[0036] And IC chip 10B for mounting of a midcourse phase is arranged to such an adhesive electric conduction particle 1.
[0037] Next, as shown in drawing 4 (b), IC chip 10B for mounting is pressurized by 2 Ns of loads, heating at the temperature of 80 degrees C.
[0038] In this case, while most adhesive electric conduction particles 1 on a plate 17 are crushed by being pushed on the resist film 15 of IC chip 10B for mounting, the adhesive electric conduction particle 1 pastes it up on the resist film 15 by heating the adhesives 5 on the surface of the electric conduction particle 4, and fusing.
[0039] On the other hand, while a part of adhesive electric conduction particle 1 is crushed by being pushed on the pad section 13 which is in each contact hole 16 of IC chip 10B for mounting at a ball and its bottom, the adhesive electric conduction particle 1 pastes it up on the pad section 13 by heating the adhesives 5 on the surface and fusing.
[0040] In the case of the gestalt of this operation, the outside clearance ratio of the adhesive electric conduction particle 1 is defined within fixed limits here to the magnitude of the pad section 13 of IC chip 10B for mounting. Furthermore, since the depth of a contact hole 16 was made smaller than the outer diameter of the adhesive electric conduction particle 1, at least one adhesive electric conduction particle will be held in each contact hole 16 of IC chip 10B for mounting in the condition of not contacting mutually, on count.
[0041] As shown in drawing 4 (c), after removing a pressurization load and exfoliating a plate 17 from IC chip 10for mounting B, it is immersed in caustic-alkali-of-sodium water, and the resist film 15 is removed from IC chip 10for mounting B with the adhesive electric conduction particle 1 adhering to this. On the other hand, since the adhesives 5 of the adhesive electric conduction particle 1 are not corroded in caustic-alkali-of-sodium water, the adhesive electric conduction particle 1 has been pasted up on the pad section 13.
[0042] This obtains the IC chip 10 for mounting of the culmination which has arranged the adhesive

electric conduction particle 1 only in the pad section 13 of IC chip 10A, as shown in drawing 4 (d). The adhesive electric conduction particle 1 is arranged in the condition of having projected partially from the surface of the protection oxide film 13 at each pad section 13 of this IC chip 10 for mounting. The adhesive electric conduction particle 1 here has restored only the constant rate according to the repulsive force defined with the recovery R about the electric conduction particle 4 from the condition crushed when the electric conduction particle 4 used as a nucleus was pressurization irrespective of what kind of configuration is taken by flowing, in case the surface adhesives 5 are heating.

[0043] Drawing 5 is drawing showing the production process of the mounting method using IC chip for mounting obtained by the final process of drawing 4 . With reference to drawing 5 , the mounting method using the IC chip 10 for mounting of the gestalt of this operation is explained.

[0044] As shown in drawing 5 (a), the circuit board 21 which should connect with the IC chip 10 for mounting of a culmination is first fixed on the base for thermocompression bondings (not shown), and opposite arrangement of the IC chip 10 for mounting is carried out at the circuit board 21. Next, the adhesive electric conduction particle 1 of the IC chip 10 for mounting is positioned to the electrode 22 which should be connected among the electrodes which have the predetermined circuit pattern formed in the circuit board 21.

[0045] And it pressurizes by 10 Ns of loads, heating the IC chip 10 for mounting at the temperature of 180 degrees C, as shown in drawing 5 (b). In this case, the electric conduction particle 4 is crushed with a purge by heating and pressurizing each adhesive electric conduction particle 1 in the adhesives 5 which exist between them between the pad section 13 of the IC chip 10 for mounting, and the electrode 22 of the circuit board 21.

[0046] Here, since the electric conduction particle 4 has elastic isotropy from having made this configuration spherical, it does not call at the location in contact with the electrode 22 of the pad section 13 of the IC chip 10 for mounting, or the circuit board 21, but only about 1 quantum is always compressed in the pressurization direction. Consequently, the pad section 13 of the IC chip 10 for mounting is electrically connected with the almost same gap as the electrode 22 of the circuit board 21 through the electric conduction particle 4 which carried out elastic deformation, respectively.

[0047] The surface portions of a crevice or the electric conduction particle 4 which the adhesives 5 in each electric conduction particle 4 produced on the other hand between the pad section 13 of the electric conduction particle 4 and the IC chip 10 for mounting and the electrode 22 of the circuit board 21 are pasted also with these 3 person with an influx and the condition that this inserted by using the electric conduction particle 4 as a base material between the putt section 13 of the IC chip 10 for mounting, and the electrode 22 of the circuit board 21. Then, when such adhesives 5 cool and harden, it is fixed to this, with the condition maintained that the IC chip 10 for mounting was electrically connected with the circuit board 21.

[0048] As stated above, after giving an adhesive property to the electric conduction particle 4 according to the gestalt of this operation, since the IC chip 10 for mounting which has arranged the adhesive electric conduction particle 1 positively was used only for the pad section 13 of IC chip 10A, connection reliability can be certainly acquired also to the electrode 22 with which the circuit board 21 was formed into the fine pitch.

[0049] Moreover, since according to the gestalt of this operation the repulsive force of the electric conduction particle 4 which makes the nucleus of the adhesive electric conduction particle 1 was regulated with the recovery R and the electric conduction particle 4 reverts beyond a desired value when thermocompression bonding of the adhesive electric conduction particle 1 is carried out to IC chip 10A, the IC chip 10 for mounting with which the adhesive electric conduction particle 1 overflowed certainly the surface of the protection oxide film 13 of the IC chip 10 can be obtained.

[0050] Since the outer diameter of the adhesive electric conduction particle 1 was especially defined at a fixed rate to the magnitude of the contact hole 16 of the IC chip 10 for mounting in the case of the gestalt of this operation, it can arrange independently, without making each pad section 13 condense the adhesive electric conduction particle 1.

[0051] Consequently, while it is not necessary to prepare a **-like bump electrode in the pad section 13

of IC chip 10A like the conventional technology by using this IC chip 10 for mounting Since the uncertainty of making the electric conduction particle which flows the inside of the different direction electroconductive glue 5 intervene between the electrode section of IC chip 10A and the electrode 22 of the circuit board 21 is cancelable, connection reliability can be raised rather than the case where the different direction electroconductive glue 5 is used.

[0052] Since the repulsive force of the adhesive electric conduction particle 1 was regulated with the recovery R and electric conduction grain 4 child does elastic deformation in connection with this on the other hand even if the resin portion of the electric conduction particle 4 does not cause plastic deformation after pressurization but the gap of electrodes changes after aging, the situation where flow resistance goes up can be prevented.

[0053] furthermore, since according to the gestalt of this operation the electric conduction particle 4 of the adhesive electric conduction particle 1 was made spherical and the gap of each electrodes of IC chip 10A and the circuit board 21 can be made into about 1 law, connection reliability can be raised also from this point.

[0054] Moreover, according to the gestalt of this operation, since the adhesives 5 which do not have an adhesive property in ordinary temperature were given to the electric conduction particle 4, the adhesive electric conduction particle 1 which is easy to deal with it in case the IC chip 10 for mounting is produced can be obtained.

[0055] Since adhesives 5 were especially given only to the electric conduction particle 4 in the case of the gestalt of this operation, there is an advantage that the amount of adhesives 5 can be reduced compared with the case where the different direction electroconductive glue 5 is used.

[0056] In addition, this invention is not restricted to the gestalt of the above-mentioned implementation, but can make various change. For example, in the gestalt of the above-mentioned implementation, since this adhesive strength is strengthened further, in case the IC chip 10 for mounting is stuck to the circuit board 21 by pressure, it is possible, although the IC chip 10 for mounting and the circuit board 21 were pasted up only with the adhesives 5 contained in the adhesive electric conduction particle 1 to also make the adhesives 5 of the shape of the shape of a film which does not contain an electric conduction particle, and a paste intervene among these.

[0057] Moreover, in the gestalt of the above-mentioned implementation, although the plate 17 was used as a plane which distributes the adhesive electric conduction particle 1, this invention can also distribute a direct adhesive property electric conduction particle to homogeneity at the field by the side of the electrode of IC chip 10B for mounting itself.

[0058]

[Example] Hereafter, the mounted example to the circuit board is explained to details with the example of a comparison using IC chip for mounting concerning this invention.

[0059] As an example, the adhesive electric conduction particle which used the electric conduction particle of 5% of recovery as the nucleus was pasted up on each pad section of IC chip, and IC chip for mounting was produced.

[0060] As an example of a comparison, the adhesive electric conduction particle which used the electric conduction particle of 0% of recovery as the nucleus was pasted up on each pad section of IC chip, and IC chip for mounting was produced.

[0061] Each of IC chip for mounting of an example and IC chip for mounting of the example of a comparison was stuck to the circuit board by pressure the condition for the temperature of 180 degrees C, 20 Ns of loads, and 20 seconds, and it connected. Then, after repeating the thermo cycle between -55 degree C and 125 degrees C 100 times, the flow resistance test was performed. Consequently, the number of defective continuity's terminal electrodes is shown below among ten terminal electrodes.

[0062] [Example]

(1) First stage After 0 / 10(2) thermo cycle 0/10 [the example of a comparison]

(1) First stage After 0 / 10(2) thermo cycle It became clear that IC chip for mounting of the result or more of 5/10 to an example can acquire connection reliability after aging.

[0063]

[Effect of the Invention] As stated above, according to this invention, the mounting method of the semiconductor device which can connect certainly each electrodes of the semiconductor device of a fine pitch and the circuit board can be acquired. Moreover, according to this invention, the semiconductor device for mounting used for mounting of a semiconductor device can be obtained.

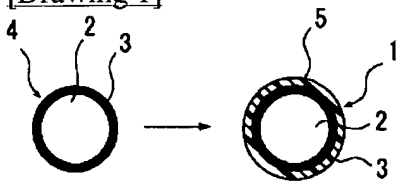
[Translation done.]

* NOTICES *

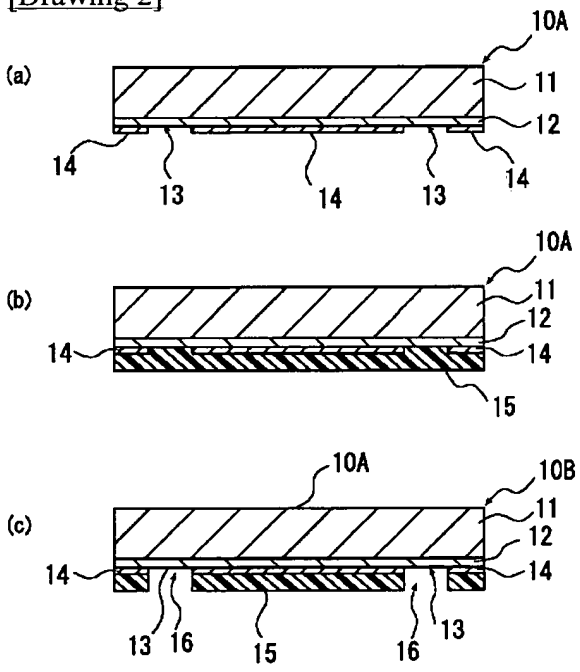
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

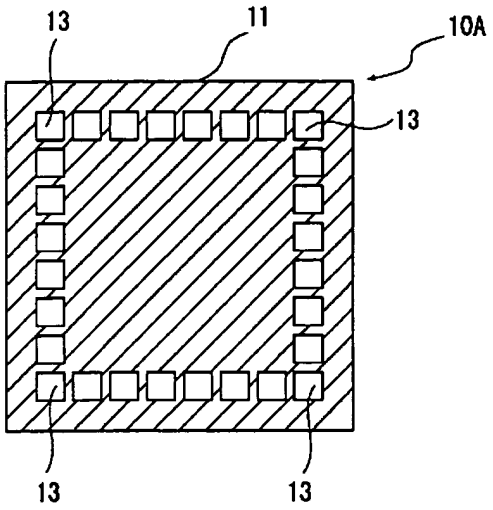
[Drawing 1]



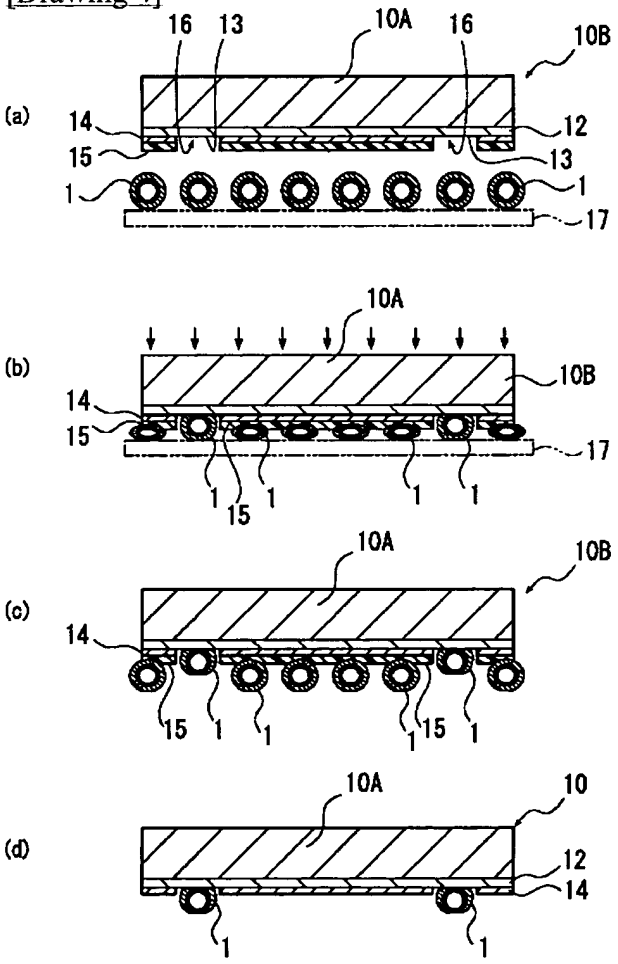
[Drawing 2]



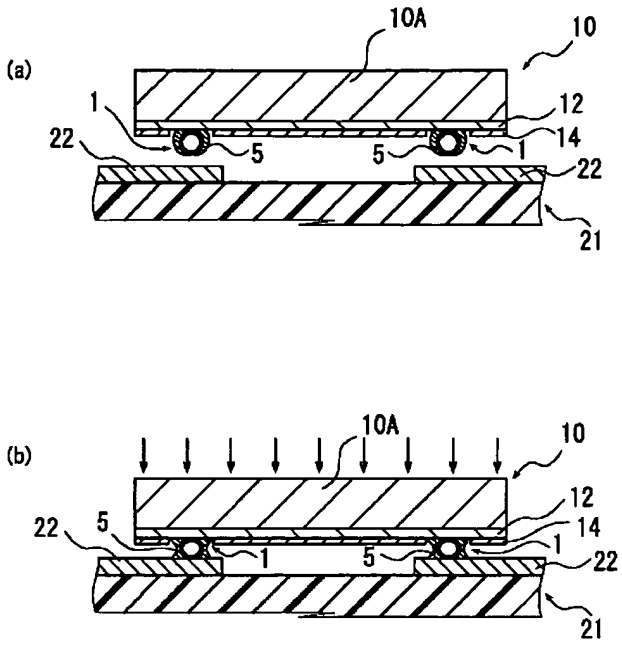
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]